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Government of India  
Ministry of Railways  
(Railway Board)

Report  
*of the*  
Thirty-Eighth Meeting  
*of the*

Locomotive Standards Committee

January 1958

Issued by Research Design & Standardization Organisation  
Chittaranjan  
(Dist, Burdwan)

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## I.—INTRODUCTION

In accordance with Director Standardization, Mechanical Engineering, Research, Design & Standardisation Organisation, Railway Board's letter No. LSC/XXXVIII, dated 17th December 1957 to the General Managers, Indian Railways, the Locomotive Standards Committee, met at Khargpur on 7th January 1958 and continued its work until it adjourned on the 8th January 1958.

The following officers attended the Meeting :—

Chairman	Shri	J. W. E. Gurr, Chief Mechanical Engineer, Central Railway.
Member	„	S. Chakravarti, Chief Mechanical Engineer, Southern Railway.
„	„	J. F. Muncherjee, Chief Mechanical Engineer, Western Railway.
„	„	A. K. Mullick, Chief Mechanical Engineer, Eastern Railway.
„	„	K. C. Lall, Chief Mechanical Engineer, Northern Railway.
„	„	P. S. Venkataraman, Chief Mechanical Engineer South Eastern Railway.
„	„	S. S. Jagota, Deputy Chief Mechanical Engineer, (W). C.L.W. Chittaranjan.
Secretary	„	R. Krishnamurti, Joint Director, Standardisation (Loco.), R.D.S.O. Chittaranjan.

(i) Shri M. M. Khan, Chief Mechanical Engineer, North Eastern Railway, was unable to attend the Meeting.

(ii) Shri R. L. Vohra, Joint Director Research (Mech.) was present at the meeting as an observer on behalf of the Director Research, Railway Testing & Research Centre, Lucknow.

(iii) Shri R. G. da Costa, Director Standardisation, (Mech. Engineering) also attended the meeting.



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II.—REPORT OF THE XXXVIII MEETING OF THE LOCOMOTIVE  
STANDARDS COMMITTEE HELD AT KHARGPUR ON 7th JANUARY,  
1958

**A. Covering Letter from the Chairman, Locomotive Standards  
Committee**

To

The Director Standardisation (Mechanical Engg.)  
Research, Design & Standardization Organisation,  
Chittaranjan.

Dear Sir,

I have the honour to submit herewith the minutes of the XXXVIII meeting of the Locomotive Standards Committee.

KHARGPUR;

*Dated, the 8th January, 1958.* }

Yours faithfully,

J. W. E. GURR,  
*Chairman,*

*Locomotive Standards Committee.*





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**B Subject Index**

Item No.	Subject	Description	Page No.
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3	L/BD	Centre Buffer Coupler	
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5	L/EQ	Speedometers/Speed Recorders	
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9	L/PX	Piston Rod and Piston heads (Piston Ring)	
10	L/TY	Tyre (Flangeless profiles)	
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**C. List of Drawings Accompanying XXXVIII LSC Report**

Description of Drawings	Drawing No.	Last Alt. No.	Paragraph No.
1	2	3	4
Modified engine rubbing block with manganese Steel liners WG, WL & WP Locos.	CSL 1957	3	2
Hydrostatic dosing solution tank & details for tender water treatment.	2654	1	7
Hydrostatic dosing gear arrangement and details YG&YP class tenders.	2655	1	7
Hydrostatic dosing gear and details WP class tenders	2656	1	7
Hydrostatic dosing gear arrangement and details—WG & "WG, WP" common tenders.	2657	1	7
Application of Spring Steel liners to engine rubbing block	2718	..	2
Proposed "XE 2" class loco. 2-8-2 type (with 9000 gallons tender).	2683	1	8





## D. Report of the XXXVIII Locomotive Standards Committee January, 1958

### Item No. 1

Subject . . . . . L/AB.

Description . . . . . AXLEBOXES (Roller Bearing).

LSC References . . . . .

RDSO File REF . . . . .  $\left\{ \begin{array}{l} \text{SL/RB} \\ \text{No. 8689, dated 26-8-57} \end{array} \right.$  S. No. (566) SKF.

Class of Loco concerned . . . . . All.

Trial No. (if any) . . . . .

**Agenda . . . . . TO CONSIDER THE PRESCRIBING OF LIFE LIMIT FOR ROLLER BEARINGS IN AXLEBOXES FOR LOCOMOTIVES.**

Notes by Secretary . . . . . When ordering roller bearing axleboxes, it has so far been the practice to specify only the load factor and not the life factor. In roller bearings, as in other components, fatigue phenomenon determines the average life. Roller bearings/ axleboxes which are apparently interchangeable and which operate under identical conditions may exhibit a dispersion in the life values. This makes it necessary to formulate a precise definition of the term 'life'—life being taken in the sense of that period of useful operation which can be anticipated with reasonable probability. In this context it is necessary to weigh the contradictory requirements of reliable service and low cost. According to the International Standards Organisation, the estimated life is generally defined as that number of bearing revolutions which will be exceeded by 90% of the bearings in use. It is for consideration whether Indian Railways should not also adopt a standard procedure for estimation of equivalent loads and life of roller bearings on the lines of the I.S.O. draft proposal, relevant extracts of which are appended for ready reference (APPENDIX I).

Inspired by competition, the manufacturers bring out designs of lighter construction at lower cost and unless the life factor is considered, an economic choice of roller bearing cannot be made properly.

It is, therefore, essential to lay down the desired life for roller bearings and the following values may be considered as representative for Indian Railway practice :

BG Passenger Locos	.	.	$40 \times 70,000$ $= 2.8$ million miles.
BG Goods Locos	.	.	$40 \times 40,000$ $= 1.6$ million miles.
MG Passenger Locos	.	.	$40 \times 40,000$ $= 1.6$ million miles.
MG Goods Locos	.	.	$40 \times 25,000$ $= 1$ million miles.

The implication in prescribing the above mileage is that 90% of the roller bearings can be expected to outlast the life of the locomotive itself.

The Committee may consider the desirability of specifying both load and life limits to guide in the selection of suitable sizes of bearings from competitive offers.

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY, 1958)

**Committee's Recommendation**

**Railway Board's Orders**

**Para 1.** The Committee recommends that both load and life limits for roller bearings should be included in the specifications for future designs of roller bearings axleboxes of steam locomotives. The Committee also recommends that initially the following life limits should be adopted for steam locomotives:—

**Para 1.** Approved. Similar mileages should also be stipulated for diesel and electric locomotives, on the basis of experience.

<b>B.G. Passenger Locos.</b>	<b>2·8 million miles</b>
<b>B.G. Goods Locos.</b>	<b>1·6 „ „</b>
<b>M.G. Passenger Locos.</b>	<b>1·6 „ „</b>
<b>M.G. Goods Locos.</b>	<b>1·0 „ „</b>



**REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE**  
(JANUARY, 1958)

**Item No. 2**

Subject . . . . . L/BD.

Description . . . . . BUFFING & DRAW GEAR (Inter Draw Gear).

LSC References . . . . .

RDSO File Reference . . . . .	{	<b>SL/WG/IC.</b>	<b>S. No.</b>
		No. SL/WG/IC, dated 11-7-57 . . . . .	(31) RDSO
		No. M. 110/2/10, dated 22-8-57 . . . . .	(33) WR

Class of loco concerned . . . . . WP, WG & WL.

Trial No. (if any) . . . . . Nil.

**Agenda . . . . . TO CONSIDER THE PROVISION OF "U" SHAPED LINERS ON THE INTERMEDIATE RUBBING BLOCKS OF WP, WG & WL LOCOMOTIVES.**

Notes by Secretary . . . . . The provision of manganese liners on the inter rubbing blocks of WP locos and the insertion of 2 piece make-up liners behind the engine rubbing block are shown in CSL Drg. 1957. The above features have been incorporated on a large number of new WP, WG and WL locos. Although instructions had been issued to Railways to follow the above CSL Drg. on existing WP locos, it appears that much progress has not been made owing to difficulty in procuring manganese liners and in having to replace the original engine rubbing blocks.

The Western Railway have, as an alternative, modified the original casting of inter rubbing block and fitted "U" shaped spring steel liners which are required to be inserted in place, and claim that this modification which has been applied to all the original WP locos on their system has proved satisfactory in service, although one or two instances have come to notice of the liners dropping off in service. On laying out on the drawing board, it is observed that on  $r$  in  $8\frac{1}{2}$  turnouts and  $10^\circ$  curves, the contact zone falls outside the liner which, thus relieved of the inter buffing load, is liable to get dislodged and fall off, in case the liner is a slack fit on the block.

The Committee may review the previous recommendation and decide on the basis of experience on new WG locos fitted with the revised design of inter rubbing block having manganese liners:

- (i) whether manganese liners should continue to be fitted on new builds;
- (ii) whether on 270 out of the original lot of 300 WP locos, the proposal outlined in Western Railway drawing should be adopted in preference to the modification shown in CSL Drg. No. 1957 which has been followed on the remaining 30 WP locos.

**Committee's Recommendation**

**Para 2. The Committee recommends that the design as shown on CSL Drg. 1957 Alt. No. 2, but with a single piece make-up liner, should continue as standard. The Committee also recommends that it should be left to the discretion of railways to adopt a design of spring steel liner similar to that shown on Western Railway Drg. No. LRB 1726 Alt. No. 1, as and when manganese steel is not available for replacement purposes.**

**Railway Board's Orders**

**Para 2. Approved. R.D.S.O. should prepare drawing showing application of spring steel liner as alternative to manganese steel liner for new builds and replacements.**

**REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY, 1958)**

**Item No. 3**

Subject . . . . . L/BD.

Description . . . . . CENTRE BUFFER COUPLER.

LSC References . . . . . ..

RDSO File References	{	<b>SL/CP &amp; SL/CP/1</b>	<b>S. No.</b>
		No. 56/467/14/M, dated 29-2-56	(51) Rly. Bd.
		No. SL/CP, dated 29-3-56	(55) CSO.
		No. RS/ABC, dated 9-4-57	(62) CSO/NDLS
		D.O. No. 57/467/103/M/1, dated 6-9-57	(163) Rly. Bd.
		No. SL/CP, dated 22-11-57	(164) RDSO.

Class of loco concerned . . . All B.G. Goods & Shunting Locos.

Trial No. (if any) . . . . . ..

**Agenda . . . . . TO CONSIDER THE APPLICATION OF CENTRE BUFFER COUPLER WITH TRANSITION SCREW COUPLING, GENERALLY AS SHOWN IN CSL DRAWINGS 2667 TO 2670, 2671 TO 2674 ON WG AND XE CLASS LOCOMOTIVES.**

Notes by Secretary . . . . . The question of replacing the IRS screw coupling draft gear by centre buffer couplers on rolling stock in view of the envisaged freight train loads of 3,200 ton rising ultimately to 7,000 tons is engaging the Board's attention. In anticipation of the ultimate change-over to the C.B. Coupler on freight wagons, it is obvious that early action is necessary in respect of its application on locomotives.

It is essential that steam locomotives, especially those hauling heavy freight services such as XE, AWE, WG and Garratts and a number of shunting locomotives, should be fitted with C.B. Couplers very early. It is considered that the C.B. Coupler should have a transition screw coupling arrangement in order that a locomotive can be coupled to stock fitted with either I.R.S. screw coupling draft gear or with the C.B. Coupler.

Of the two types of C.B. Coupler, viz., 'Atlas' and 'Alliance' types referred to in CSL Drg. Nos. 2668 & 2672 the coupler bodies, draft yoke and other cast steel details are planned for production in India very early. The draft gear may also be produced at no distant date.

The Committee may consider the proposals outlined above and recommend the application of C.B. Coupler shown in the CSL drawings for WG and XE class locomotives. Similar drawings will be prepared for other standard locos.

**Committee's Recommendation**

**Para 3. The Committee notes that the 'Atlas' and 'Alliance' couplers are the only types readily available which are designed for a screw coupling transition arrangement. The Committee, therefore, recommends the adoption of these two types, as an interim measure.**

**Para 4. The Committee also recommends that arrangements should be made as quickly as possible for the provision of Centre Buffer Couplers with a transition screw coupling, generally as shown on CSL Drg. Nos. 2667 to 2670 and 2671 to 2674, on XE, AWE, WG, Garratt and certain shunting locomotives.**

**Railway Board's Orders**

**Paras 3 & 4. R.D.S.O. should investigate the suitability of Centre Buffer Couplers without the knuckle feature and submit a report on the relative merits of the different designs for Board's orders.**

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY, 1958)

Item No. 4

Subject . . . . . L/BE.  
Description . . . . . BOGIE, TRUCK DETAILS (Constant Resistance Centering Device).  
LSC References . . . . . XXXVII—3 & 4.

	SL/WP/DELTA	S. No.
RDSO File References	MRA/23 of 7/8-1-57 . . . . .	(44) (RTRC)
	SL/WP/DELTA of 15-1-57 . . . . .	(45) (RDSO)
	MRA/23 of 2-3-57 . . . . .	(54) (RTRC)
	SL/WP/DELTA of 20-3-57 . . . . .	(56) (RDSO)
	MRA/23 of 11-7-57 . . . . .	(121) (RTRC)
	MRA/23 of 8-10-57 . . . . .	(137) (RTRC)
	MRA/23 of 29-10-57 . . . . .	(146) (RTRC)
	SL/WP/DELTA of 14-11-57 . . . . .	(147) (RDSO)
	” ” . . . . .	(150) (RDSO)

Class of Loco concerned . . . . . “WP”.  
Trial No. (if any) . . . . . ..  
Agenda . . . . . **TO REVIEW THE RESEARCH REPORT OF OSCILLATION TRIALS ON “WP” LOCOMOTIVES FITTED WITH CONSTANT RESISTANCE CENTERING DEVICE.**

Notes by Secretary . . . . . The above subject has been carried over from last year’s agenda. According to recent advice, the trials have not yet concluded but an interim report may be available on the device fitted on engine bogie only. The Research Directorate is expected to circulate this report before the meeting.

Committee’s Recommendation	Railway Board’s Orders
<p>Para 5. In the absence of the Research Directorate’s report the Committee recommends that consideration of this subject should be deferred. The Committee notes that in the opinion of the R.D.S.O. the existing speed restriction placed on these locomotives is no longer necessary and recommends, therefore, that instructions should be issued to the Railways as quickly as possible removing this restriction.</p>	<p>Para 5. Research Directorate should expedite the oscillation trial report, and also take action to authorise removal of existing speed restriction on these WP locomotives.</p>

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY, 1958)

Item No. 5

Subject . . . . .	L/EQ.																				
Description . . . . .	SPEEDOMETERS, SPEED RECORDERS.																				
LSC References . . . . .	XVI-7, XXII-76, XXXII-93, 94, XXXIII-63 to 65, XXXIV-32 XXXVI-14.																				
RDSO File REF . . . . .	<table> <tr> <th>SL/SPR</th><th>S. No.</th></tr> <tr> <td>SL/SPR, dated 30-3-56 to CMEs C. Rly. &amp; W. Rly. . . . .</td><td>(505) (RDSO)</td></tr> <tr> <td>M. 265, S. 25, dated. 28-3-57 . . . . .</td><td>(531) (C. Rly.)</td></tr> <tr> <td>M. 540/4/13/dated 29-4-57 . . . . .</td><td>(534) (W. Rly.)</td></tr> <tr> <td>SL/SPR, dated 29-5-57 to M/s. Toshniwal Bros. . . . .</td><td>(536) (RDSO)</td></tr> <tr> <td>SL/SPR, dated 29-5-57 to CMEs. C. Rly. and W. Rly. . . . .</td><td>(537) (RDSO)</td></tr> <tr> <td>BDT/57 dated 10-6-57 . . . . .</td><td>(538) (M/s. Toshniwal Bros.)</td></tr> <tr> <td>BDT/755/57, dated 28-6-57 . . . . .</td><td>(539) (,, ,)</td></tr> <tr> <td>MG. 18/10/2393, dated nil . . . . .</td><td>(545) (M/s. H. &amp; G. Ltd.)</td></tr> <tr> <td>M. 265, S. 25, dated 23-9-57 . . . . .</td><td>(546). (C. Rly.)</td></tr> </table>	SL/SPR	S. No.	SL/SPR, dated 30-3-56 to CMEs C. Rly. & W. Rly. . . . .	(505) (RDSO)	M. 265, S. 25, dated. 28-3-57 . . . . .	(531) (C. Rly.)	M. 540/4/13/dated 29-4-57 . . . . .	(534) (W. Rly.)	SL/SPR, dated 29-5-57 to M/s. Toshniwal Bros. . . . .	(536) (RDSO)	SL/SPR, dated 29-5-57 to CMEs. C. Rly. and W. Rly. . . . .	(537) (RDSO)	BDT/57 dated 10-6-57 . . . . .	(538) (M/s. Toshniwal Bros.)	BDT/755/57, dated 28-6-57 . . . . .	(539) (,, ,)	MG. 18/10/2393, dated nil . . . . .	(545) (M/s. H. & G. Ltd.)	M. 265, S. 25, dated 23-9-57 . . . . .	(546). (C. Rly.)
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M. 265, S. 25, dated 23-9-57 . . . . .	(546). (C. Rly.)																				
Class of Loco concerned . . . . .	"WP".																				
Trial No. (if any) . . . . .																					
Agenda . . . . .	<b>TO REVIEW REPORTS OF PERFORMANCE OF DEUTE-WERKE SPEED RECORDING EQUIPMENT.</b>																				
Notes by Secretary . . . . .	<p>Trials have been carried out by the Western and Central Railways with Deute-Werke speed recording equipment as desired by the Railway Board in their orders on para 65 of the 33rd LSC report. The reports so far received indicate that the performance of the Deute-Werke instrument is satisfactory and that the maintenance costs are in no way more than for the Teloc Recorders. The Railways have been asked to submit further reports on the performance of these instruments and these will be tabled at the meeting for consideration.</p> <p>In view of the satisfactory performance of the Deute-Werke equipment and the likelihood of its being produced indigenously, the Committee may consider its acceptance as a permissible alternative.</p>																				

Committee's Recommendation

Para 6. In view of the experience of the Central and Western Railways, the Committee considers that it is too early to accept the DEUTE-WERKE recording speedometer as a permissible alternative. The Committee recommends, therefore, that the trials should continue,

Railway Board's Orders

Para 6. Trials with DEUTE-WERKE and Teloc recording speedometers should continue for a further period of one year and the performance reviewed at the next L.S.C. meeting.

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY 1958)

**Item No. 6**

Subject . . . . . L/GEN.

Description . . . . . GENERAL (Internal water treatment).

LSC References . . . . . XXXVI-76.

RDSO File Reference . . . . .	{	<b>SL/SR</b>	<b>S. No.</b>
		U.O.I. No. KRA/1 dated 24-11-56.	(169) RTRC.
		U.O.I. No. SL/SR dated 30-8-57.	(197) CSO.
		No. SL/SR. dated 25-10-57 to all Railways.	(202) RDSO.
		No. M./540/4/14/2 dated 7-12-57.	(209) WR.

Class of Loco concerned . . . . . All.

Trial No. (if any) . . . . .

**Agenda . . . . . TO RECORD CSL DRG. NOS. 2654 TO 2657 SHOWING  
THE INTERNAL WATER TREATMENT DOSAGE  
GEAR FOR WP/WG AND YP/YG LOCOMOTIVES.**

Notes by Secretary . . . . . The Railway Board ordered, *vide* para 76 of the 36th L.S.C. report that trials should be carried out with an automatic dosing gear. Trials with separate infeed of the solution into the injector delivery proved unsuccessful owing to high rate of suction of the injector and consequent emptying of the solution tank within a short time, unless the suction pipe is fitted with a constricted orifice which would however get choked up in service. Subsequently a hydrostatic dosing gear as outlined in RDSO sketch No. L-407 was evolved and circulated to railways for trial. The Western Railway have carried out trials with a similar dosing gear, but without the clack valve and reported satisfactory results. Based on the W. Rly's experience, CSL Drgs. 2654 to 2657 have been prepared showing the application of a similar dosing gear on WP/WG and YP/YG locos. These drawings have been circulated to railways with instructions to proceed with the manufacture and fitment to the extent necessary.

The Committee may record these drawings and authorise the fitment of this dosing gear on new builds.

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**Committee's Recommendation**

**Para 7. The Committee considered the arrangement shown on CSL Drgs. Nos. 2654 to 2657 and does not feel it necessary for all new builds to be fitted with dosing gear. The Committee recommends, therefore, that it should be left to the discretion of individual railways to fit this equipment on their own locomotives.**

**Railway Board's Orders**

**Para 7. (i) The application of dosage gear to WP/WG and YP/YG locomotives on the lines of Drawings CSL 2654 to 2657 is approved.**

**(ii) R.D.S.O. should issue drawings for fitting dosage gear to other I.R.S. locomotives.**

**(iii) Railways should prepare drawings on similar lines for non-I.R.S. locomotives.**

**(iv) Such dosing gear should be fitted to locomotives to the extent necessary.**

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY 1958)

Item No. 7

Subject . . . . . L/GEN.  
Description . . . . . GENERAL (New Design of Loco).  
LSC References . . . . .  
RDSO File Reference . . . . .  $\left\{ \begin{array}{l} \text{SL/XE/IM} \\ \text{SL/XE} \end{array} \right.$   
Class of Loco Concerned . . . . . XE-2.  
Trail No. (if any) . . . . . Nil.  
Agenda . . . . . **TO APPROVE C.S.L. DRG. NO. 2683 FOR A MODERNISED DESIGN OF XE CLASS 2-8-2 TYPE STEAM LOCOMOTIVE WITH BOGIE TENDER HAVING INCREASED COAL AND WATER CAPACITIES.**

Notes by Secretary . . . . . With the emphasis on maximum through-put to be achieved by haulage of freight train loads of large tonnage, it is considered that the scope for utilisation of the XE class locomotive is enhanced, particularly on non-electrified sections of Indian Railways capable of taking  $22\frac{1}{2}$  ton axle loads. The future trend of traffic indicates that the manufacture of the WG class locomotive, which is a medium size goods unit, should be gradually discontinued and the heavy XE class locomotive should be built early in sufficient numbers.

CSL Drg. No. 2683 is a diagram of the revised design of XE class locomotive which incorporates the following improvements :

- (i) The boiler proportions have been revised conforming with the boiler ratios approved *vide* para 130 of the minutes of the XXXI L.S.C. Meeting.
- (ii) The valve gear has been revised as a long travel valve gear with increased steam lap.
- (iii) Mechanical stoker will be fitted.
- (iv) The ash pan capacity will be increased to the extent possible.
- (v) Roller bearing axleboxes will be fitted on both coupled and carrying axles.
- (vi) The tender will be designed to carry 18 tons of coal and 9,000 gallons of water. It will be mounted on two 3-axle bogies with a maximum axle-load of 20 tons.
- (vii) Indigenous raw materials will be used to the maximum extent possible.

The Committee may approve the revised design and also recommend the early manufacture of this unit.

Committee's Recommendation

Para 8. The Committee considered the proposed design for a  $22\frac{1}{2}$  ton axleload locomotive as shown on CSL Drg. No. 2683 Alt. No. 1 and recommends its adoption.

Railway Board's Orders.

Para 8. Approved.



REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY 1958)

**Item No. 8**

Subject . . . . .	L/GEN.
Description . . . . .	GENERAL (Limits and fits for Locomotive work).
LSC References . . . . .	XXXII-107.
RDSO file references . . . . .	<div style="display: inline-block; vertical-align: middle;"> <div style="display: inline-block; vertical-align: middle;"> } SL/TS  } SL/ISI/METRIC. </div> </div>
Class of Loco concerned . . . . .	All.
Trial No. (if any) . . . . .	Nil.
<b>Agenda . . . . .</b>	<b>TO APPROVE THE REVISED CODE OF I.R.S. SYSTEM OF LIMITS &amp; FITS FOR LOCOMOTIVE WORK.</b>
Notes by Secretary . . . . .	In accordance with the Railway Board's decision to adopt the Metric System of weights and measures on Indian Railways, it is essential that the existing code of "I.R.S. limits & fits to be used for locomotive work" based on the Inch system should be revised in the Metric System and issued to loco building workshops and Railways in order to facilitate planning for an early change over to the Metric System. It is also necessary that I.R. Part Drawings should be prepared forthwith in the Metric system, based on the revised code.

\*Appendix II is a draft of the revised system of limits and fits in the Metric System. In the preparation of the revised code, opportunity has been taken to relax the tolerances and limits of certain items in the light of past experience and comparison of practices in foreign countries.

The Committee may scrutinise the revised code and suggest changes, if necessary, for incorporation before issue.

### Committee's Recommendation

**Para 9. As Railways have not had sufficient time to examine the draft code of limits & fits for the metric system, the committee recommends that each Railway should submit their comments to the R.D.S.O. On receipt of these comments the R.D.S.O. will depute an officer to individual railways to settle issues in respect of which discussions are considered necessary.**

## Railway Board's Orders

**Para 9. Revised code of I.R.S. limits and fits for the Metric System should be finalised by R.D.S.O. in consultation with Railways.**

\*Not printed in the report.

Subject	L/PX.
Description	PISTON ROD AND PISTON HEADS (Piston Rings).
LSC References	XXVII-34.
RDSO File Reference	<div style="display: inline-block; vertical-align: middle;"> <b>SL/PR.</b>          { No. SL/PR dated 19-10-57 to CME/N. Rly.       </div> <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> <b>S. No.</b>          (452). (RDSO).       </div>
Class of Loco concerned	All.
Trial No. (if any)	TLF 4. 10.

Notes by Secretary . . . . . Hunt Spiller piston rings were originally introduced on American locomotives—A/CWD, MAWD, etc.—and the performance of these rings was recorded in CSO Trial Form TIF 4-5. The subject was reviewed under Item 24 of the minutes of the 27th L.S.C. meeting and the Committee recorded that the B.A. and BBCI Railways have reported very favourably and the experience of other railways has been similar, the life being at least twice and probably more than the standard type of ring. The Committee recommended the adoption of the Hunt Spiller piston ring, but Railway Board's orders thereon indicated that the adoption should pend decision on the general question of manufacturing patented items in Railway Workshops.

Trials are in progress with Lip Type cast iron and bronze segmental piston rings on WG locomotives on the Northern Railway and also with phosphated cast iron piston rings on a number of W.G. locomotives issued from the Chittaranjan Locomotive Works.

The Committee may review the problem and recommend the future design to be adopted.

REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY 1958)

**Committee's Recommendations**

**Para 10.** Bearing in mind the cost and the amount of work involved, the Committee considers that experience up to the present with locally made lip type piston rings does not yet justify a changeover to this type of ring on all standard locomotives. The Committee recommends, therefore, that Railways should continue experiments with the object of producing a two-metal lip type piston ring which would give a life of approximately 30,000 miles. They should also endeavour to increase the life obtained at present from the existing design of narrow cast iron rings. In these trials, cylinder wear should also be recorded.

The progress made by Railways should be reviewed at the next meeting.

**Railway Board's Orders**

**Para 10. (i)** Extensive trials should be carried out on the Northern, Central, Eastern and Southern Railways with:

- (a) two-metal lip type piston rings
  - (b) Centrifugally cast narrow rings
  - (c) Centrifugally cast and phosphated narrow rings
- on B.G. and M.G. locomotives to establish the relative performance and economics of each type.

- (ii) R.D.S.O. should issue revised trial forms in this connection. The trials should be completed in good time for consideration at the next L.S.C. meeting.



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**ITEM No. 10**

Subject . . . . .	L/TY.	
Description . . . . .	TYRES (Flangeless Profiles).	
LSC References . . . . .	XXXIII-42.	
RDSO File Ref. . . . .	<div style="display: inline-block; vertical-align: middle;"> <b>SL/TYR</b>  D.O. No. 53/731/6/M dated 8-1-54.  <b>SL/YP/TYR</b>  No. SL/YP/TYR, dated 4-3-54.  No. SL/YP/TYR dated 28-11-57. </div>	<b>S. No.</b> (377) Rly. Bd.  (23) CSO (106) RDSO.
Class of Loco concerned . . . . .	4-6-2 type.	
Trial No. (if any). . . . .		
<b>Agenda . . . . .</b>	<b>TO CONFIRM THE REMOVAL OF THE FLANGES ON THE DRIVING WHEELS OF 4-6-2 TYPE OF LOCOMOTIVES.</b>	
Notes by Secretary . . . . .	Railway Board's Orders on para 42 of the 33rd LSC Report approved the Committee's recommendation and indicated that all future 2-8-2, 2-8-4 and 4-6-2 locomotives are to be provided with flangeless driving wheels.	

At a meeting of the C.M.Es. with D.M.E. at Chittaranjan on the 7th & 8th January '54, the above subject was reviewed on the suggestion of the D.M.E. and it is recorded in the minutes that it is desirable to postpone the application of the flangeless tyre to future sixicoupled locomotives pending further experience with existing YP Locomotives having flangeless driving wheels and results of trials to be carried out by the Research Directorate. It is pointed out that altogether 230 YP locomotives were placed in service with flangeless driving wheels and up-to-date there has been no instance of derailment on main line and curves conforming to the schedule of dimensions, attributable to the presence of the flangeless tyre. It has been detected, however, that the driving wheel tends to develop a slight hollow after considerable mileage.

The incidence of fractures of bar frames on WP locos predominantly occurring on the Western Rly. in the region on either side of the driving horn gap is considered to be the result of high stress intensities imposed by lateral loads while negotiating sharp curves and turnouts. It is felt that the removal of the flange on the driving wheels would minimise the lateral loads and eliminate the fractures developing on the bar frames. It has been investigated that the removal of the flange on existing tyres would permit a safe landing margin on the tyre even on 1 in 8½ turnouts. When renewals are effected the width of the flangeless tyre can be increased to 5½."

In the light of experience gained on the YP class locomotives and in realisation of the benefits accruing from the removal of the flange on the driving wheels of WP locomotives, the committee may confirm their former recommendation in favour of the flangeless tyre recorded against Item 38 of the report of the XXXIII L.S.C. meeting.

**Committee's Recommendation**

Para 11. The Committee noted that the R-D.S.O. proposal does not take into account the possibility of a horse shoe liner dropping off. The Committee recommends, therefore, that the problem should be re-examined taking this possibility into account. The Committee also recommends that trials should be conducted with the new "WP" locomotives now being received with roller bearing coupled wheel axleboxes, to determine the frame stresses in the region of the driving horn gap on engines with and without flanges on the driving wheels. These trials should be given high priority.

**Railway Board's Orders.**

Para 11. (i) Since R.D.S.O. find on further investigation that the width of contact of the tyre with the rail would be inadequate in the event of a face liner dropping off in service, flangeless driving wheel tyres should not be fitted on such WP locomotives which have axleboxes with separate face liners.

(ii) The Western Railway should arrange to remove the flange on the driving wheel tyres of one of the Austrian

### Committee's Recommendations

The Committee also recommends that the Western Railway should experiment with the removal of the driving wheel flanges on existing WP locomotives. In this connection, it would be necessary to ensure that this is done only in conjunction with solid bronze boxes, *i.e.*, not on boxes with separate horse shoe liners.

### Railway Board's Order

built WP locomotives fitted with roller bearing axleboxes on the coupled wheels, at the earliest opportunity. Research Directorate should carry out trials to ascertain the intensity of stress in the bar frame on the above locomotive and also on one of the standard WP locomotives having driving wheels with thin flange. These trials should be conducted on the Western Railway on high priority.

- (iii) In order to minimise the incidence of fractures on bar frames, the Western Railway should take steps to remove the flange on the driving wheel tyre, provided that bronze axle boxes without separate face liners, *i.e.* with face liners cast integrally with the axleboxes will be used on all the coupled axles. As and when opportunity arises, the existing 5½" driving wheel tyres should be replaced with 5½" wide flangeless tyres of the driving wheel. R.D.S.O. should issue the necessary part drawing.



REPORT OF THE XXXVIII LOCOMOTIVE STANDARDS COMMITTEE  
(JANUARY 1958)

**Item No. 11**

Subject	L/MISC.
Description	Miscellaneous.
LSC References	
RDSO File Reference	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div> <b>LSC/XXXIII.</b>            Letter No. 52/731/1/M of 30-7-52 to all            GMs.         </div> <div style="margin-left: 20px;"> <b>S. No.</b>            (17) (RB).         </div> </div>
Class of Loco concerned	...
Trial No. (if any).	
<b>Agenda</b>	<b>TO ELECT THE MEMBERS OF THE SUB-COMMITTEE OF THE XXXIX LOCO STANDARDS COMMITTEE.</b>
Notes by Secretary	In terms of Railway Board's letter No. 52/731/1/M of 30-7-52, the XXXVII Loco Standards Committee elected the C.M.Es/Central and Western Railways, to serve on the Sub-Committee of the XXXVIII L.S.C.

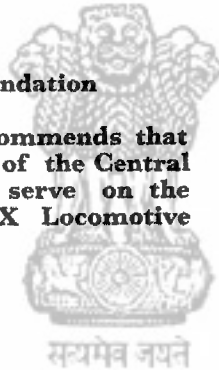
Members are requested to elect two members for the Sub-Committee of the XXXIX L.S.C. to be held in 1958/59.

**Committee's Recommendation**

**Para 12. The Committee recommends that the Chief Mechanical Engineers of the Central and Western Railways should serve on the Sub-Committee for the XXXIX Locomotive Standards Committee meeting.**

**Railway Board's orders**

**Para 12 Approved.**



## APPENDIX I—(ITEM No. 1)

**Method of Evaluating Dynamic Load Ratings of Radial Roller Bearings.****A. Definitions :**

1. The "life" of an individual roller bearing is defined as the numbers of revolutions (or hours at some given constant speed) which the bearing runs before the first evidence of fatigue develops in the material of either ring or of any of the rolling elements.
2. The "rating life" of a group of apparently identical roller bearings is defined as the number of revolutions (or hours at some given constant speed) that 90 per cent of a group of bearings will complete or exceed before the first evidence of fatigue develops.
3. The "basic load rating" is that constant stationary radial load which a group of apparently identical roller bearings with stationary outer ring can endure for a rating life of one million revolutions of the inner ring. In single row angular contact roller bearings the basic load rating relates to the radial component of the load which causes a purely radial displacement of the bearing rings in relation to each other.
4. Load ratings, if given for specific speeds are to be based on a rating life of 500 hours.
5. The "equivalent load" is defined as that constant stationary radial load which, if applied to a bearing with rotating inner ring and stationary outer ring, would give the same life as that which the bearing will attain under the actual conditions of load and rotation.

**B. Calculation of Basic Load Rating, Rating Life and Equivalent Load:**

1. It is recognized that revisions of this recommendation may be required from time to time as the result of improvements of new developments.

**2. Basic Load Rating :**

The magnitude of the basic load rating  $C$ , for radial roller bearings is

$$C = f_c (i \text{ eff } \cos \alpha)^{7/8} Z^3 / 4 D^{29/27}$$

where

- $i$  = the number of rows of rollers in any one bearing
- $\alpha$  = the angle of contact = the angle between the line of action of the roller resultant load and a plane perpendicular to the bearing axis
- $Z$  = the number of rollers per row
- $D$  = the roller diameter (the mean diameter of tapered rollers)
- $\text{leff}$  = the effective length of contact between one roller and that ring where the contact is the shortest (overall roller length minus roller chamfers, or minus grinding undercuts).
- $f_c$  = a factor which depends on the exact geometrical shape of the load carrying surfaces of the rollers and rings, the accuracy to which the various bearing parts are made and the material. Values of  $f_c$  are obtained by multiplying  $f_e$  by a factor  $f$ , covered in Appendix 1.

Roller bearings vary considerably in design and execution. Small differences in the relative shape of contacting surfaces may account for distinct differences in load carrying capacity. It is therefore not possible to give detailed information about the exact basic load rating of a certain general type of roller bearing.

The approximate basic load rating of a roller bearing of good design in all details and made by a reputable roller bearing manufacturer, may be obtained by the use of the  $f_e$  values given in table 2.1.

Actual basic load ratings of different bearing types and executions may differ from the value indicated. A bearing must be expected to have a lower carrying capacity when, under load, more or less accentuated stress concentrations in the roller contacts are present (point contact) or are not effectively prevented (sharp corners or rigid bearing design). The basic load rating may be increased over the value indicated when even stress distribution over the whole roller length is automatically assured. For no bearing type or execution will the factor  $f_e$  exceed the value indicated by more than 14 per cent.

TABLE 2.1

Factor  $\frac{f_c}{f}$ 

$\frac{D \cos \alpha}{d_m}$	1)	$\frac{f_c}{f}$
0.01		0.083
0.02		0.097
0.03		0.106
0.04		0.113
0.05		0.118
0.06		0.123
0.07		0.126
0.08		0.130
0.09		0.132
0.10		0.134
0.12		0.138
0.14		0.140
0.16		0.141
0.18		0.142
0.20		0.142
0.22		0.141
0.24		0.140
0.26		0.138
0.28		0.136
0.30		0.134

NOTE :

1)  $d^m$  = the pitch diameter of the roller set.

## 3. Rating Life :

The approximate magnitude of the rating life  $L$  is :

$$L = \left( \frac{C}{P} \right)^{10/3} \text{ million revolutions.}$$

where

 $P$  = the equivalent load.

## 4. Equivalent Load :

The magnitude of the equivalent load  $P$ , for self-aligning and tapered roller bearings of conventional types under combined constant radial and constant thrust load is :

$$P = XVF_r + YF_a$$

Where

 $X$  = a radial factor. $V$  = a rotation factor. $Y$  = a thrust factor. $F_r$  = the radial load. $F_a$  = the thrust load.Values of  $X$  and  $Y$  are given in table 2.2. $V = 1$  for inner ring rotating in relation to the load. $V = 1.2$  for outer ring rotating in relation to the load.The factor  $V$ , due to lack of sufficient experimental evidence, is to be considered as a factor of safety.



TABLE 2.2  
Factors X and Y

Bearing Type	$\frac{F_a}{VF_r} \leq e$		$\frac{F_a}{VF_r} > e$		e
	x	y	x	y	
Self-aligning and tapered roller bearings $\alpha \neq 0$	Single Row Bearings				
	1	0	0.4	$0.4 \cot \alpha$	$1.5 \tan \alpha$
	Double Row Bearings <sup>1)</sup>				
	1	$0.45 \cot \alpha$	0.67	$0.67 \cot \alpha$	$1.5 \tan \alpha$

NOTE :

(1) Double row bearings are presumed to be symmetrical.

#### Appendix I.

A recommended value of the factor f based on current tests of roller bearings of good quality, hardened roller bearing steel is :

$f=56.2$  if kg and mm units are used.

$f=49500$  if lb, and inch units are used.



## IV.—SUMMARY OF TRIALS

This summary has been prepared to secure co-ordination between Railways undertaking trials, and it is requested that separate reports be submitted in duplicate to this office by the dates given on the trial sheets.

The period of trials and general instructions are intended to serve as a guide only and may be modified at the discretion of Railways.

Reports are to be headed with serial number, title, and object of trials as described in the following summary, the body of the report being divided into the following:—

- (i) Description of method of testing adopted if different to that given in the summary ;
- (ii) Results as far as possible in tabular form on foolscap size paper; and
- (iii) Conclusions.

## (a) Current and to continue

Sl. No.	Trial No.	L.S.C. Reference	Railway undertaking trial	Title of Trial	Object of Trial	General Instructions	
						Number and types under trial	Period of trial
1	2	3	4	5	6	7	8
1	TLA 2.2	XXXIII-1 XXXV-17	All	Electric resistance welded boiler tubes.	To obtain comparative performance data of ERW and solid tubes.	Passenger, Goods, Shunting in addition to 3 WG/YP engines built by C.T.W. and FELCO.	No. of years of 2 POH (with interim report after 1st POH).
2	TLA 3.7	XXXV-44 XXXVI-19	Eastern	Thermic syphon butt welded to throat plate diaphragm.	To compare the efficiency of the butt-welded design with the fillet-welded design.	10 CLW built WGs, & YG built by contract.	2 POH periods after being commissioned.
3	TLB 4.2	XXIX-11-12 XXXI-22 XXXV-50	Central, in co-operation with research Dte.	Mechanical Stoker	To determine whether mechanical stokers are justified for locos employed over sections where firing capacity is proving up to or beyond the limit of manual firing.	..	..
4	TLC 7.1	XXXIII-6 XXXV-67	All	Expanded Metal Spark Arrestors.	To determine performance and life of the expanded metal spark arrestors as compared with standard 'Draftac'.	3 locos to be fitted with each of the 3 types of spark arrestors.	Life limit of the expanded metal spark arrestors.
5	TLD 7.4	Railway Board No. 54/467/59/M of 22-7-54	Central	FRIEDMANN's Hydrostatic displacement lubricator, Class RN (2-feed).	To compare efficiency of lubrication, economy in oil consumption and relative maintenance costs of the 'RN' lubricator against the Standard Wakefield's lubricator in use in order to determine if the 'RN' lubricator can be accepted as a Permissible Alternative.	Loco No. 2113 YP and one fitted with standard Wakefield's 2-feed sightfeed, hydrostatic lubricator.	1,00,000 miles or POH.
6	TDL 7.5	RB letter No. 54/467/59/M of 22-7-54	Central	FRIEDMANN's Hydrostatic displacement lubricator, Class RN (4 feed).	To compare efficiency of lubrication, economy in oil consumption and relative maintenance costs of the 'RN' lubricator against the standard Wakefield's lubricator in use, in order to determine if the 'RN' lubricator can be accepted as a Permissible Alternative.	Loco No. 8642 WG and one fitted with standard Wakefield's 4-feed sightfeed Hydrostatic lubricator.	1,00,000 miles or POH.
7	TLD 7.6	XXXVI-21	Northern	Wakefield Convergent Jet Atomiser.	To compare the relative wear and carbonisation on piston valve liners and rings of locos fitted with Wakefield's Convergent Jet Atomiser as against those having conventional type of lubrication connection to the steam pipe.	4 WGs-2 Nos. with Convergent Jet Atomiser & 2 Nos. with conventional type of lubrication to the steam pipe.	60,000 miles.
8	TLD 7.7	XXXVI-37	Central, Northern, S. Eastern, N-Eastern.	Nalco Wheel Flange Lubricator.	To study the extent of reduction, if any, in flange wear with the use of Nalco Flange Lubricators.	Central, on BG & NG, Northern, on NG, S-Eastern, on BG, N-Eastern, on MG, class to be selected by the Railways.	On full period between consecutive tyre turnings.

1	2	3	4	5	6	7	8
9	TLE 4.2	XXXIV-32 XXXV-39	All BG	Wedge adjusting Bolt.	To evolve a suitable design of wedge adjusting bolt for Barframe locomotives.	6 WPs as under :— 2 WPs to be fitted with wedge adjusting bolt to CSI. drg. No. 2256 Alt.1 2 WPs to be fitted with wedge adjusting bolt to Southern Rly's Sketch No. 2708/ BG 2 WPs to be fitted with wedge adjusting bolt to C. E's drg. No. E/SL-126/140.	60,000 miles
10	TLE 4.3	XXXV-38	All	Wedge Adjusting arrangement for plate frame locomotives.	To evolve a suitable design of wedge adjusting arrangement for plate frame locomotives.	One each of XA/XB, & XD, XB/XC & XE, XA/XB/XC, YB & YD, XD, XC on C,E,N,S,S-E & W Rlys, resp. on BG. & one YB & YD on. CR, one YB & YD on NR, one YB on NE, one YB/YC and YD on SR, and 1 YB and YD on WR.	60,000 miles.
11	TLF 2.3	XXXIV-39 XXXV-52 XXXVI-27	Central.	Modified double taper form of piston rod cross-head connection.	To find out if this arrangement reduces maintenance costs and improves performance as compared with standard double taper pin.	2 WG class-one with trial fittings on LH side & standard fittings on RH & the other with the trial fittings on RH side and standard fittings on LH side. The two locos with trial fittings are to be employed on the same division and on similar service.	P.O.H. to P.O.H.
12	TLG 3.12	XXXVI-24	All	Case Hardened Steel Motion Bushes.	To compare performance of case-hardened steel motion bushes, as compared with similar pins working in bronze bushes.	6 BG and/or MG locos-WP, WG, YP, YG for grease lubrication; Rlys. to select locos for oil lubrication.	18 months.
13	TLL 2.10 (Mod)	XXXI-71-72 XXXII-62 XXXIII-47	Central.	Liners of Tatas 'Ninun' Brand Manganese Nickel steel in rubbing contact for coupled and bogie wheel axlebox channels and guides and coupled wheel axlebox face and wheel hub liners.	To determine performance of trial material and extent of wear as compared with 11-14% manganese steel and other combinations in rubbing contact.	WM-1 one loco	100,000 miles after fittings trial liners
14	TLL 3.3	XXIX-70 XXX-100 XXXI-75 XXXII-66 XXXV-57	S.E. (ex-BN)	Hoffmann roller bearing axleboxes for inside & outside carrying wheels.	To compare performance with carrying wheel roller bearing axleboxes of the Timken and Skefko designs with a view to determining whether the designs are suitable for acceptance as Permissible Alternative.	2 XD class locos, 1 with Hoffmann & other with Timken bearings 3 XC class locos, 1 with Timken, 1 with Hoffmann and third with Skefko.	P.O.H. to P.O.H.
15	TLL 3.4	XXIX-70 XXX-101 XXXI-76 XXXII-66 XXXIII-46 XXXV-53	South Eastern, Central.	Roller bearing axleboxes for inside & outside carrying wheels.	To compare performance with carrying wheel roller bearing axleboxes of the Timken, Skefko and Hoffmann designs with a view to determining whether the designs are suitable for acceptance as Permissible Alternative.	Ex-GIP, 1 WG loco with SKF. Ex-GIP, 1 WG loco with Timken. Ex-BN, 1 WG loco with Hoffmann.	P.O. to P.O.

1	2	3	4	5	6	7	8
16	TLL 4.9	XXXV-55	All	Shell Alvania Grease 3 for tender axleboxes fitted with roller bearings.	To standardise one type of lubricant for roller bearing axleboxes of the three makes used on locomotive carrying axles.	As detailed in the covering letter No. SL/LB/1 of 30th August, 1955.	..
17	..	XXXVI-18 SL/FXS/III of 30-3-56 to DR/LKO.	..	Security-arch tubes versus thermic syphon.	To compare performance of boilers fitted with thermic syphon with boilers fitted with security arch tubes only.	1 WG(CLW)	..
18	..	XXXVI-20 SL/WG/IM/SH of 1-9-56.	All	Regulator Locking Device to Western Railway Drawing LCB-1843. CSL Drg. 2532.	To review alternative designs of regulator locking devices on locomotives and to decide on the future standard.	6 BG., 6 MG on each Rly.	..
19	..	XXXV/54. SL/WP/RB of 17-8-56.	..	SKF Roller bearings direct mounted on return crank journal without the removable sleeve.	To find out whether the direct mounted SKF roller bearing on return crank gives a better performance than the existing sleeve type bearings.	10 CLW WGs.	..
20	..	XXXVI-17 SL/WP/FR/I of 1-10-53 & 1-5-58	Eastern, Central.	Ballast Sweep with strengthened cattle guards.	To consider provision of ballast sweep on loco. cattle guards.	one WP on each Railway.	..

**(b) New Trials ordered by the Board**

Trial No.	L.S.C. Reference paragraph No.	Railway undertaking trial	Title of Trial	Object of Trial	General Instructions	
					Class concerned	Period of Trial
1	2	3	4	5	6	7
TLF 4.10	XXXVIII-10	Eastern, Central, Northern & Southern.	Comparative trials of alternative designs of piston rings.	To study the performance of LIP type rings fitted on the R.H. Pistons as compared to CFC/CFCP* rings on the L.H. Pistons.	4 WP, 4 WG, 4YP & 4 YG.	40,000 miles.

\*CFC-Centrifugally cast piston rings.

CFCP-Centrifugally cast and phosphated piston rings.

V.—SUMMARY OF MODIFICATIONS AUTHORISED BY THE RAILWAY BOARD IN CONNECTION WITH THE RECOMMENDATIONS OF THE XXXVIII MEETING OF THE LOCOMOTIVE STANDARDS COMMITTEE

1. The applications of these modifications to I.R.S. Locomotives placed in service before 1947 is optional, but Railways are advised, in their own interest, to incorporate these modifications when renewals of parts become necessary except where expressly stated otherwise.

2. The application of these modifications to I.R.S. Locomotives placed in service after 1947 is obligatory and must be carried out in accordance with Railway Board's Orders.

3. Drawings quoted under column "Sample Drawings" in the table indicate the type of drawings on the lines of which the modification is to be carried out.



4. Under the column "Loco and Drawing reference" the class of Locomotive to which the particular modification is applicable is indicated. Drawing Nos., if prepared, are given below the class of locos. When a modification is applicable to all I.R.S. Locos a remark is inserted to that effect. Drawings so far prepared for particular Locos are indicated, although the modification is applicable to other classes of Locos as well for which drawings have not yet been prepared.

Group modification number	Ref. para of XXXVIII LSC	Description of Modification	Sample Drawing	Loco and Drawings Reference	Remarks
AB. 4.001 AB. 5.012  TB 3.0711	1	Load and life limits of roller bearings for axleboxes to be included in the Specification.  The following life limits are to be adopted for Steam Locomotives:— BG. Passenger locomotives—2.8 million miles.  BG. Goods locomotives—1.6 million miles.  MG. Passenger locomotives—1.6 million miles  MG. Goods locomotives —1.0 million miles.  Similar mileages should be stipulated for diesel & electric locomotives on the basis of experience.	..	All IRS Locos	
BD. 4.027	2	Make up liner for engine intermediate rubbing block to be of one piece.	..	WG WP. WL. C. S. L. 1957 alt: 3	
BD. 4.028	2	Engine intermediate rubbing blocks with manganese steel liners standard.  Engine intermediate rubbing blocks with 'U' shaped spring steel liners permissible alternative for new builds & replacements when manganese steel liners are not available.	..	WG. WP. WL YP. YG. YL LA/BD. 155 LA/BD. 156 WG. WP. WL. YP. YG. YL. CSL. 2718.	
Gen. 2.032	7	Internal water treatment dosage gear to be fitted to locos.	..	ALL IRS LOCOS WP CSL. 2656 alt: 1, CSL. 2654 alt: 1. WG CSL. 2657 alt: 1, CSL. 2654 alt: 1. WP. WG (Common tender to CSL 2351) CSL 2657 alt: 1, CSL 2654 alt: 1. YP. YG. CSL 2655 alt: 1, CSL 2654 alt: 1. CSL 2683 alt: 1.	To be fitted to Locomotives to the extent necessary.
Gen. 2.033	8	Modernised design of "XE 2" class 2-8-2 type steam locomotive with bogie tender having increased Coal and Water capacities.	..	CSL 2683 alt: 1.	
Gen. 3.010	9	Revised code of IRS Limits & Fits for the metric system to be finalised in consultation with Railways.	..	All IRS locos.	



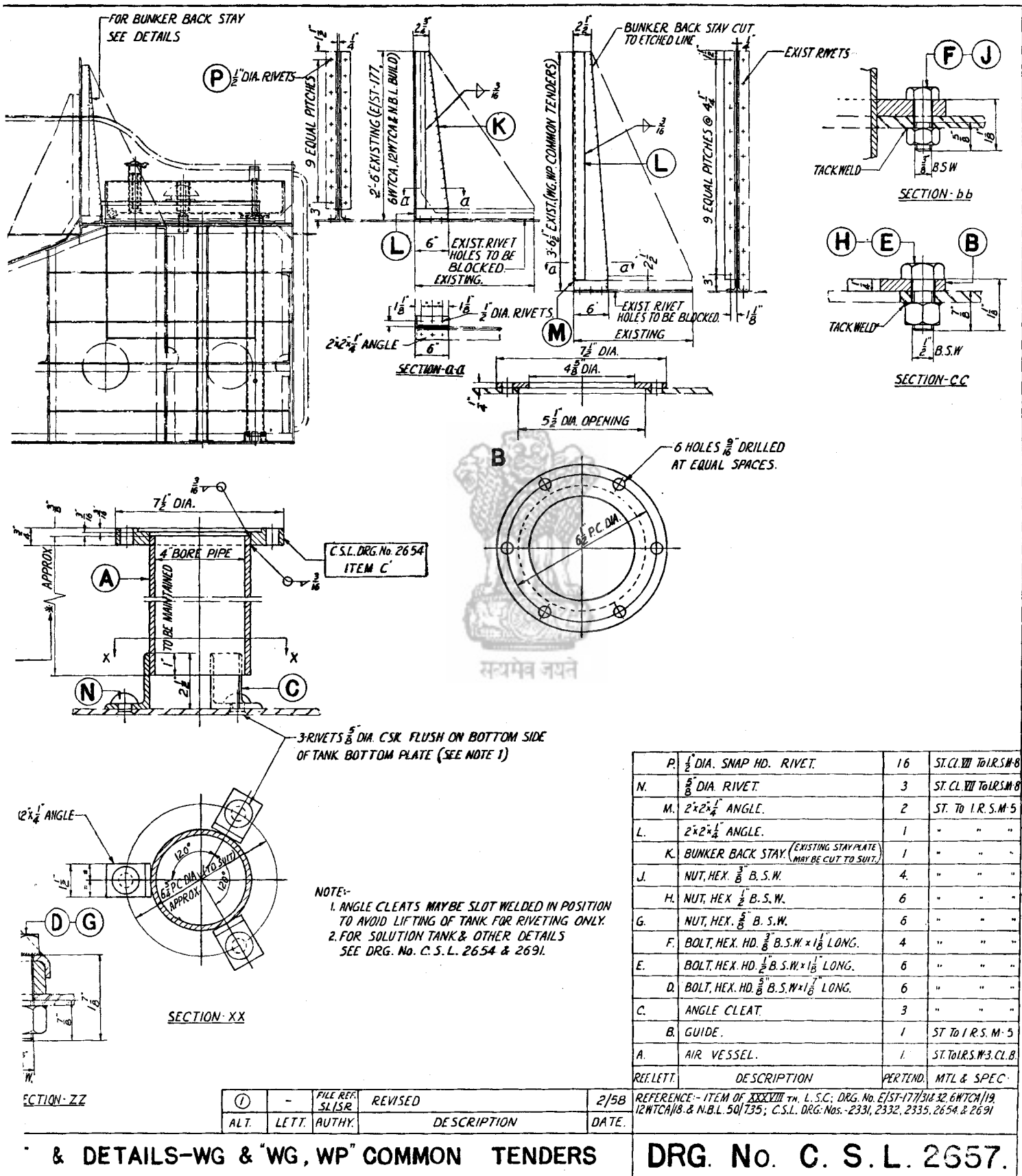


WELDING SYMBOLS TO B.S. 499 SEC. 7: 1952.

JS	XXV L.S.C.
D.	
T.	
C.	

**B.G. &  
M. G.**

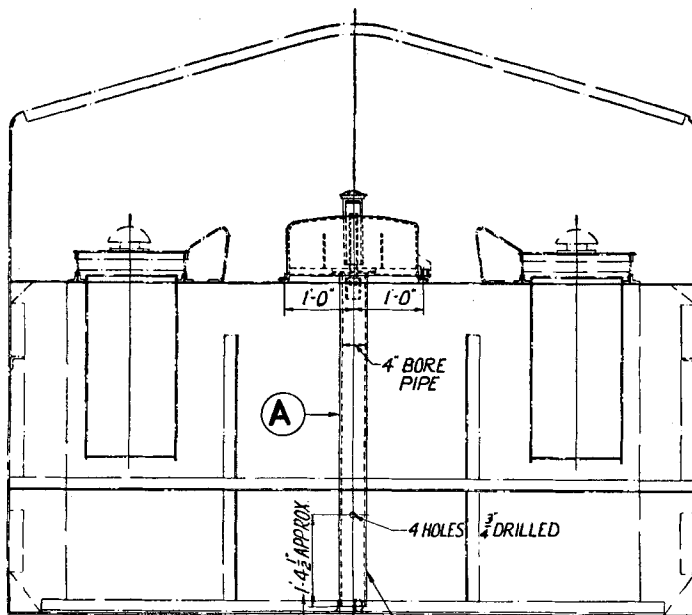
## APPLICATION OF SPRING STEEL LINE



& DETAILS-WG & "WG, WP" COMMON TENDERS

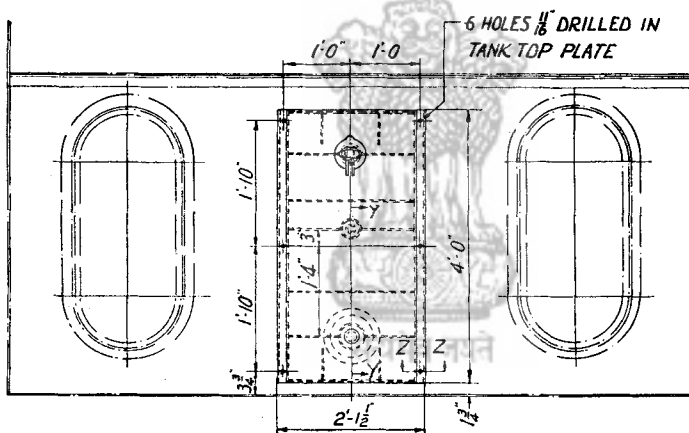
DRG. No. C. S. L. 2657.





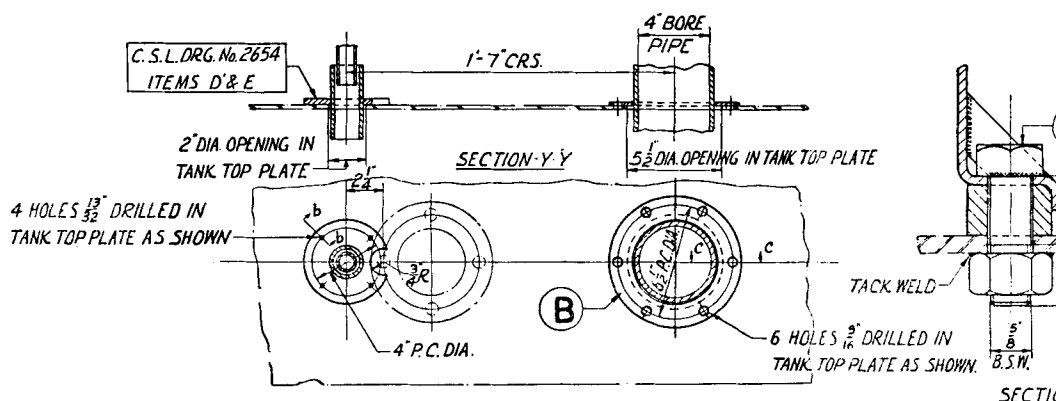
TO SUIT INDIVIDUAL RAILWAYS

AIR VESSEL TO BE HOT-DIP GALVANISED



DRG REF	DIMENSION APPROX. X
E/ST-177	6'-0 <sup>3</sup> / <sub>16</sub>
6WTCA	5'-11 <sup>3</sup> / <sub>8</sub>
12WTCA	5'-11 <sup>3</sup> / <sub>8</sub>
NBL CONSB	4'-11 <sup>1</sup> / <sub>16</sub>
WG, WP COMMON TENDER	4'-11 <sup>1</sup> / <sub>16</sub>

2' 2" X 2' 2" A

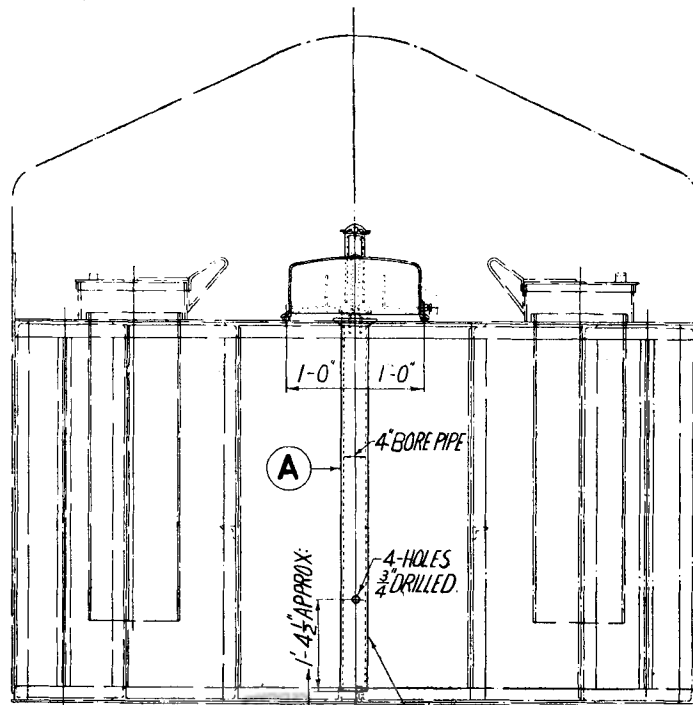


SECTION

## B.G. HYDROSTATIC DOSING GEAR ARRANGEMENT

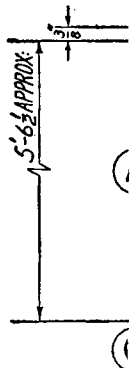
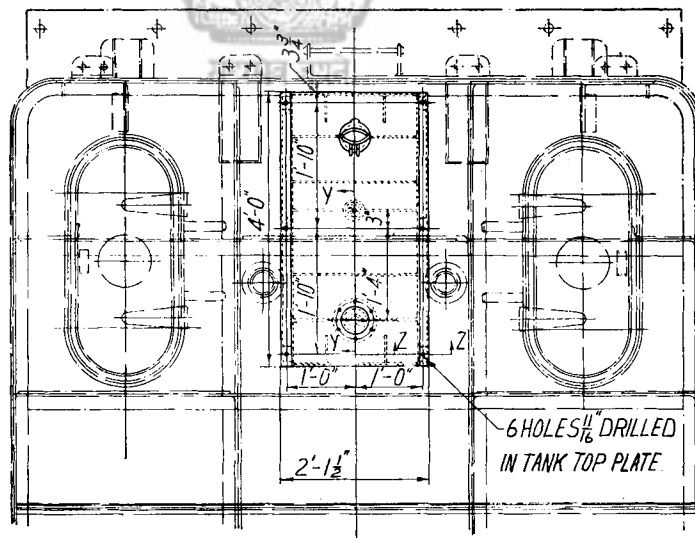


SE



TO SUIT INDIVIDUAL RAILWAYS.

AIR VESSEL TO BE HOT-DIP GALVANISED.

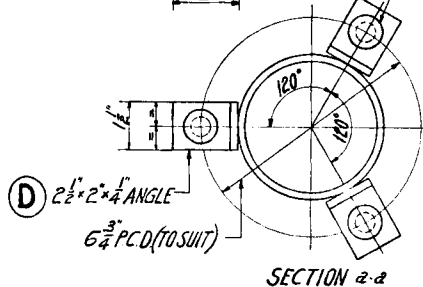
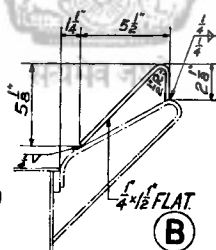
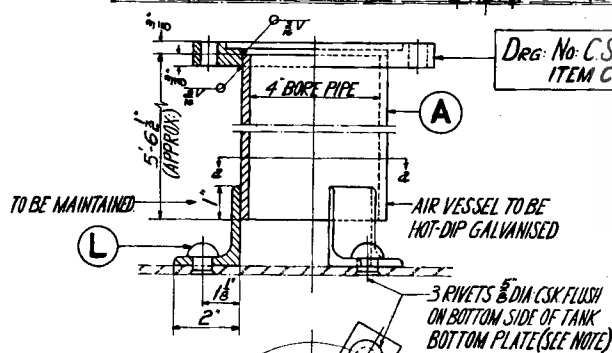
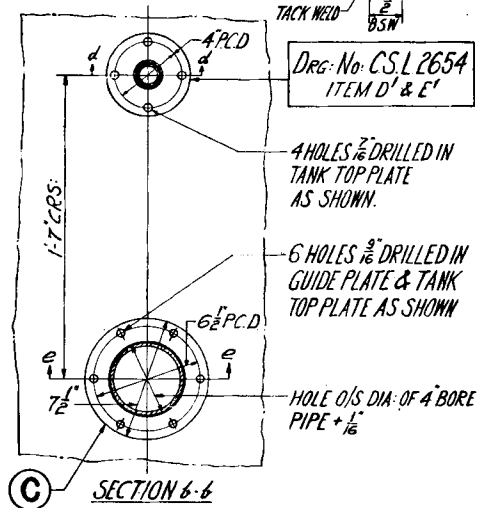
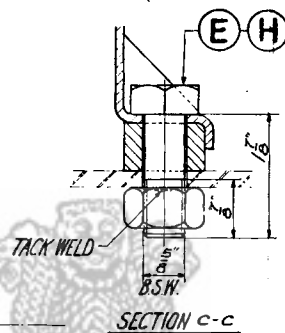
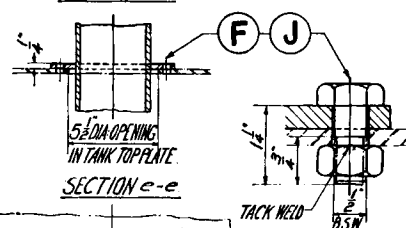
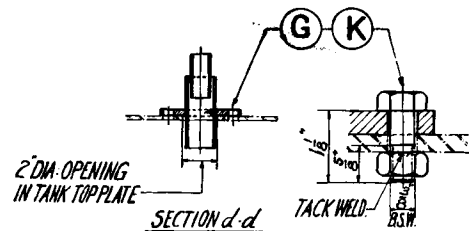
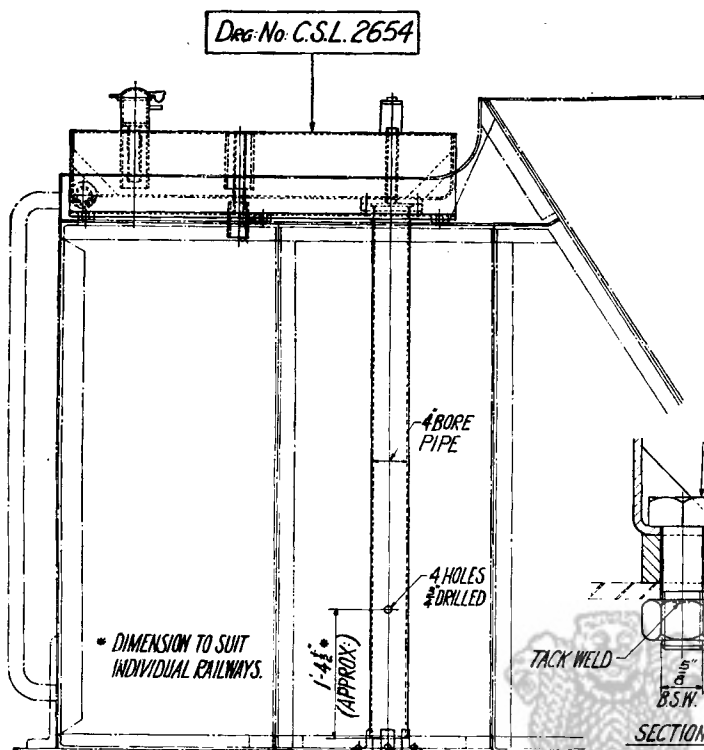


2 1/2" x 2" x 1/4" ANGLE.

JS	
D	2 1/2" x 2" x 1/4" ANGLE
T	2 1/2" x 2" x 1/4" ANGLE
C	2 1/2" x 2" x 1/4" ANGLE

B. G.

HYDROSTATIC DOSING GEAR ARRANGEMENT



NOTE:-

1. ANGLE CLEATS MAY BE SLOT WELDED TO TANK BOTTOM PLATE IN POSITION TO AVOID LIFTING OF TANK FOR RIVETING ONLY
2. FOR SOLUTION TANK & OTHER DETAILS SEE Drg. Nos C.S.L. 2654 & 2691.

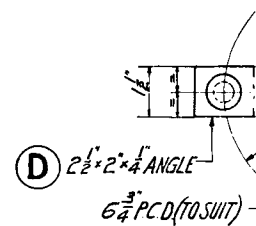
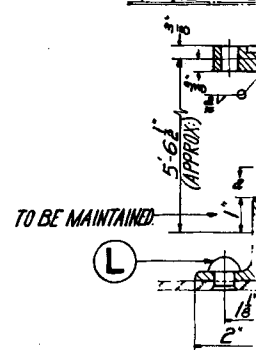
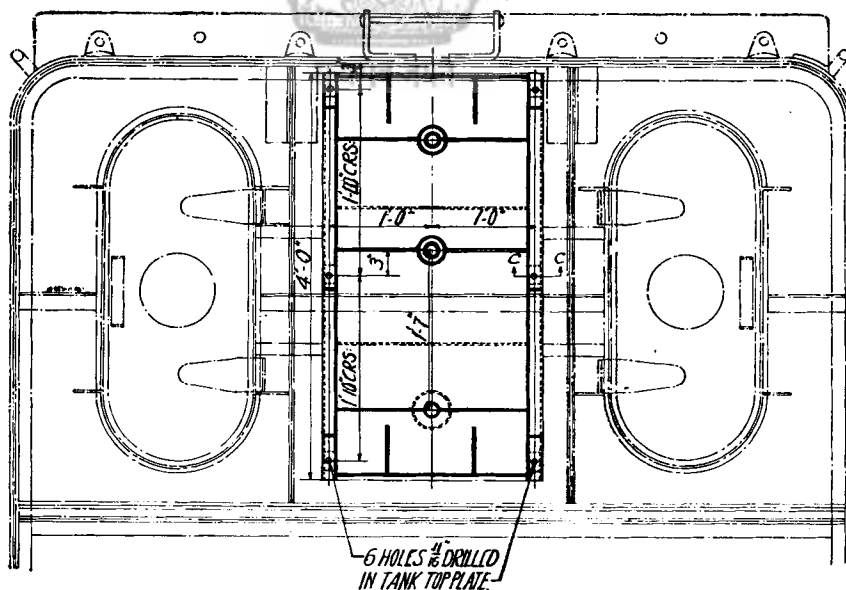
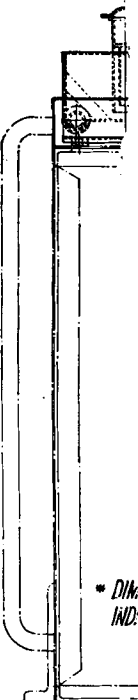
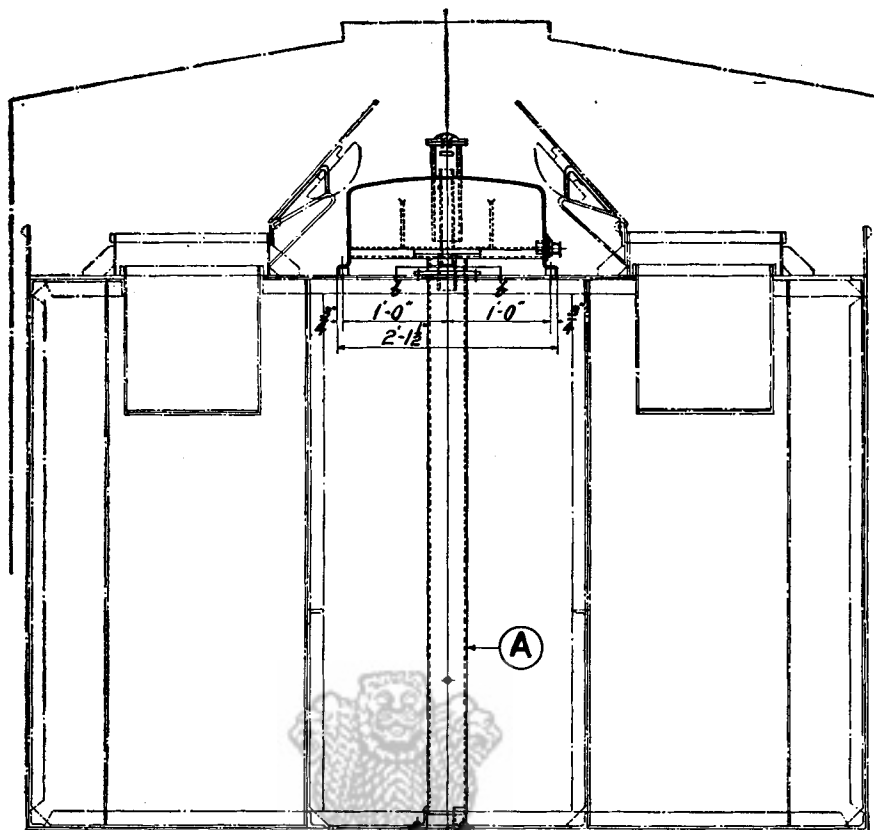
L	RIVET, $\frac{3}{8}$ " DIA.	3	ST-70 I.R.S.M-8
K	NUT, HEX: $\frac{3}{8}$ " B.S.W	4	ST-70 I.R.S.M-5
J	NUT, HEX: $\frac{1}{2}$ " B.S.W.	6	" " "
H	NUT, HEX: $\frac{5}{8}$ " B.S.W.	6	" " "
G	BOLT, HEX HD: $\frac{3}{8}$ " B.S.W $\times \frac{1}{8}$ " LONG.	4	" " "
F	BOLT, HEX HD: $\frac{1}{2}$ " B.S.W $\times \frac{1}{4}$ " LONG.	6	" " "
E	BOLT, HEX HD: $\frac{5}{8}$ " B.S.W $\times \frac{1}{8}$ " LONG.	6	" " "
D	ANGLE CLEAT	3	" " "
C	GUIDE PLATE.	1	" " "
B	LID STOP	4	ST-70 I.R.S.M-5
A	AIR VESSEL	1	ST-70 I.R.S.W3Q-B

①	ALT	LETT	AUTHY	REVISION	DATE
				REVISED	2/58
				DESCRIPTION	

REF. LETT.	DESCRIPTION	PER. TEND.
	DESCRIPTION	MTL & SPEC
	REFERENCE: ITEM OF XXXVIII TH. L.S.C.	
	Drg. Nos: E/ST-276/46, 47, 48 & 57	
	Drg. Nos: C.S.L. 2654 & 2691.	

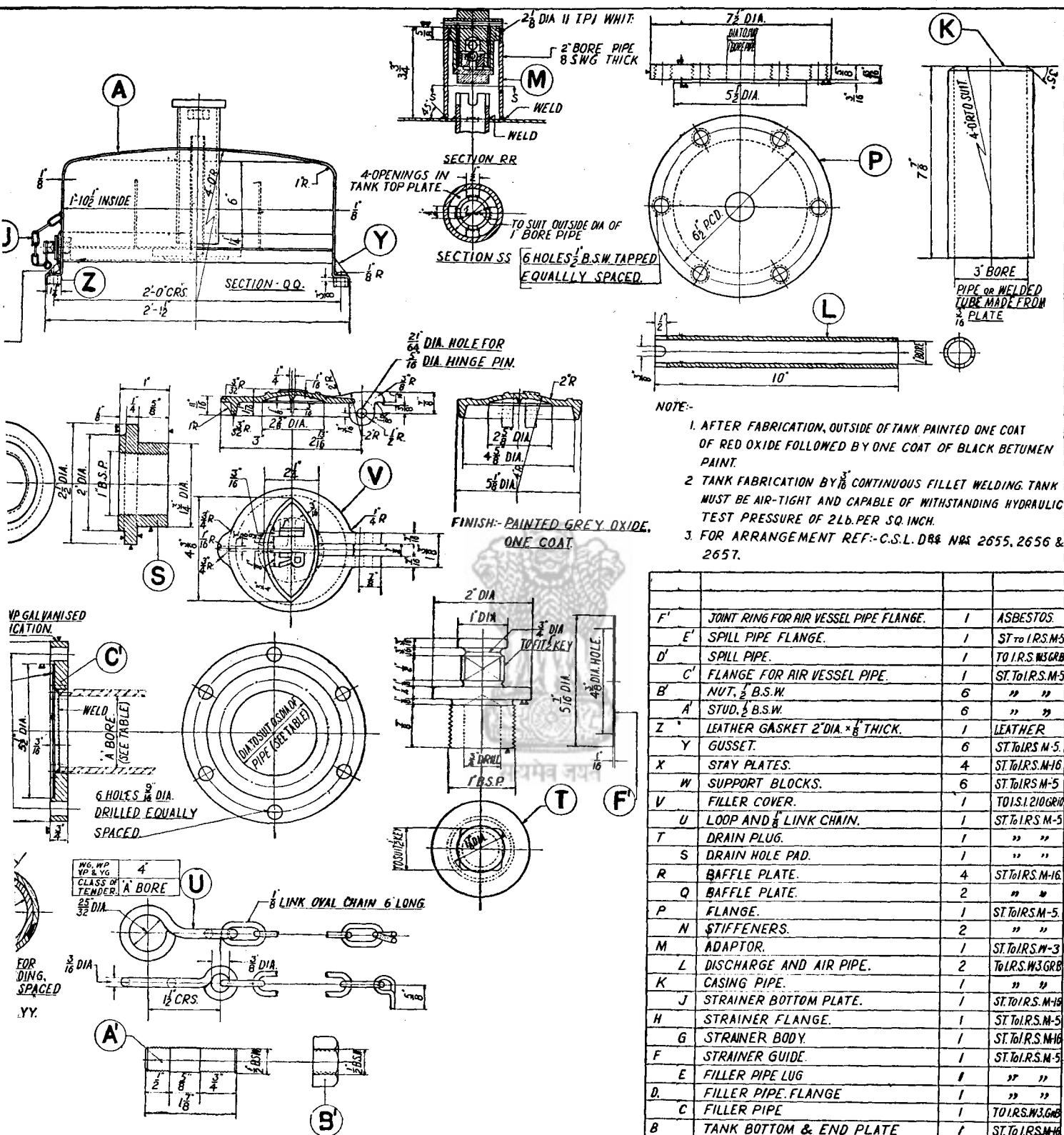
DETAILS - "YG" & "YP" CLASS TENDERS.

Drg. No. C. S. L. 2655.



M. G.

HYDROSTATIC DOSING GEAR ARRANGEMENT & DETAILS - "YG"



NOTE:-

1. AFTER FABRICATION, OUTSIDE OF TANK PAINTED ONE COAT OF RED OXIDE FOLLOWED BY ONE COAT OF BLACK BUTEN PAINT.
2. TANK FABRICATION BY  $\frac{3}{16}$ " CONTINUOUS FILLET WELDING. TANK MUST BE AIR-TIGHT AND CAPABLE OF WITHSTANDING HYDRAULIC TEST PRESSURE OF 2 LB. PER SQ. INCH.
3. FOR ARRANGEMENT REF:-C.S.L. DRG NOS 2655, 2656 & 2657.

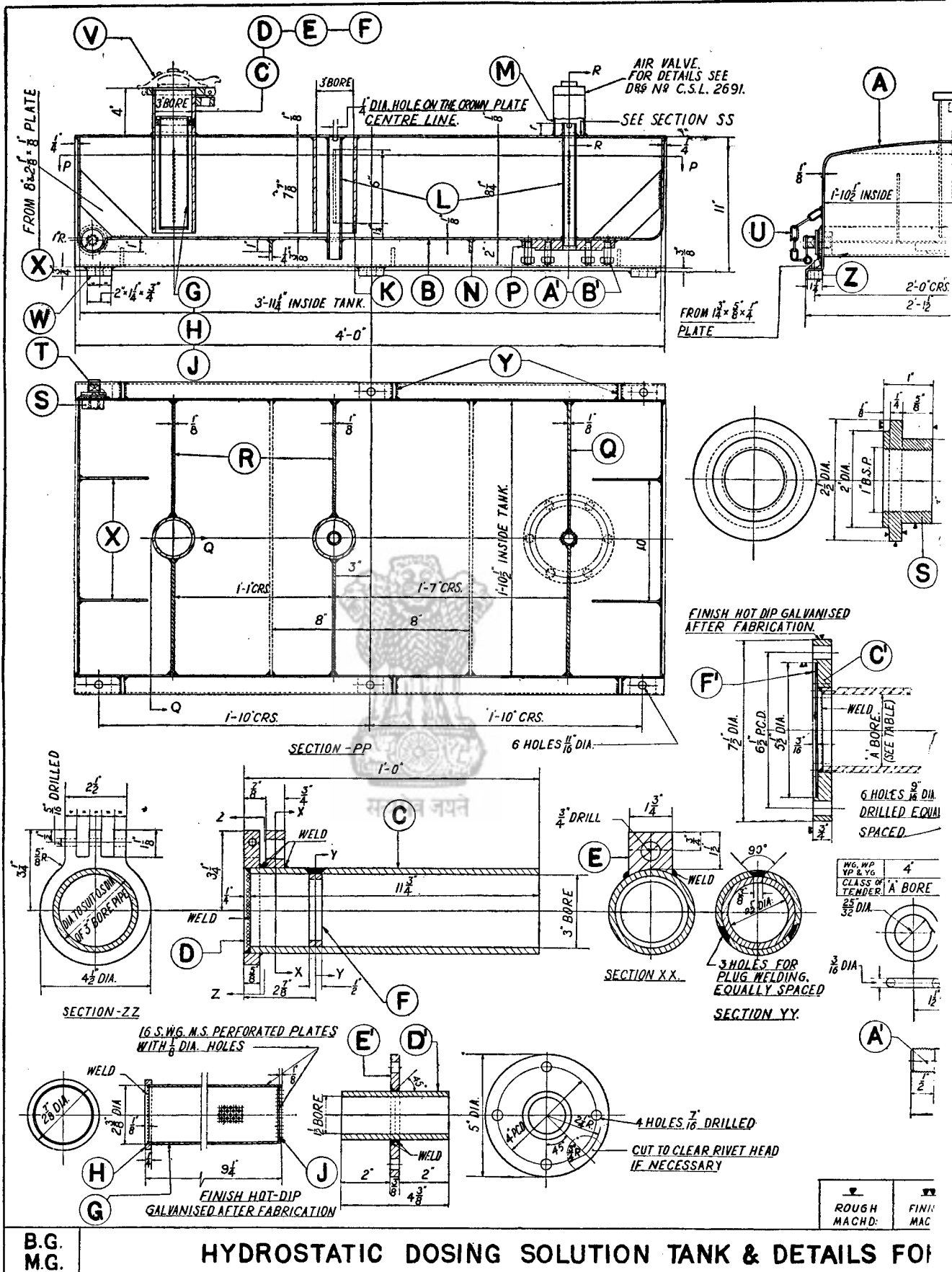
REF. LTH. IR PART	DESCRIPTION	PER ENG.	MTL. & SPEC.
F'	JOINT RING FOR AIR VESSEL PIPE FLANGE.	1	ASBESTOS
E'	SPILL PIPE FLANGE.	1	ST. TO I.R.S. M-5
D'	SPILL PIPE.	1	TO I.R.S. M-3 GRB
C'	FLANGE FOR AIR VESSEL PIPE.	1	ST. TO I.R.S. M-5
B'	NUT, $\frac{1}{2}$ B.S.W.	6	" "
A'	STUD, $\frac{1}{2}$ B.S.W.	6	" "
Z'	LEATHER GASKET 2' DIA. $\times \frac{1}{8}$ THICK.	1	LEATHER
Y'	GUSSET.	6	ST. TO I.R.S. M-5
X'	STAY PLATES.	4	ST. TO I.R.S. M-16
W'	SUPPORT BLOCKS.	6	ST. TO I.R.S. M-5
V'	FILLER COVER.	1	TO I.S.I. 210 GRB
U'	LOOP AND $\frac{1}{2}$ LINK CHAIN.	1	ST. TO I.R.S. M-5
T'	DRAIN PLUG.	1	" "
S'	DRAIN HOLE PAD.	1	" "
R'	BAFFLE PLATE.	4	ST. TO I.R.S. M-16
Q'	BAFFLE PLATE.	2	" "
P'	FLANGE.	1	ST. TO I.R.S. M-5
N'	STIFFENERS.	2	" "
M'	ADAPTOR.	1	ST. TO I.R.S. M-3
L'	DISCHARGE AND AIR PIPE.	2	TO I.R.S. M-3 GRB
K'	CASING PIPE.	1	" "
J'	STRAINER BOTTOM PLATE.	1	ST. TO I.R.S. M-16
H'	STRAINER FLANGE.	1	ST. TO I.R.S. M-5
G'	STRAINER BODY.	1	ST. TO I.R.S. M-16
F'	STRAINER GUIDE.	1	ST. TO I.R.S. M-5
E'	FILLER PIPE LUG.	1	" "
D'	FILLER PIPE FLANGE.	1	" "
C'	FILLER PIPE.	1	TO I.R.S. M-3 GRB
B'	TANK BOTTOM & END PLATE.	1	ST. TO I.R.S. M-16
A'	TANK CROWN & SIDE PLATE.	1	ST. TO I.R.S. M-16

ROUGH MACHD.	FINISH MACHD.	ALT.	LETT.	AUTHY.	DESCRIPTION	DATE

REFERENCE:- ITEM - OF XXXVIII TH. L.S.C. W. RLY DRG NO LL-316, 317, 320, 321, 322 & 323.

DETAILS FOR TENDER WATER TREATMENT.

C.S.L. DRG NO 2654.



[illegible]

THIS DRAWING SUPERSEDES C.S.L. DRG. Nos. 1786 & 1787.							
KSH FINED BL	FINE FINISH MACHINED SSZ	GROUND. Q	③	B	XXXXLSC ITEM 2 PARA 2	CHANGED FROM TWO PIECES TO ONE PIECE.	4-58
			②	A	XXXXLSC PARA 58.	HOLES FOR SLOT WELDING IN ITEM 'A' PROVIDED & NOTE ADDED.	4/54
			①	A	SL/REFIT ALUMINUM OF 22-5-53.	000" WAS 010."	5-53.
			ALT.	LETT.	AUTHX	DESCRIPTION	DATE.
CHINESE STEEL LINERS - "WG", "WL" & "WP" LOCOS.				C. S. L. DRG. NO 1957.			



**DRG: No. C.S.L. 2718**